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N. B. Number 57 and 84, are anomalous figures of snow; of which there is an infinite variety, that may be observed.

XCIX. *An Account of the Copper-springs lately discovered in Pennsylvania: By John Rutty, M. D. of Dublin. Communicated by Mr. Peter Collinson, F. R. S.*

Read May 20, 1756. **I**N the province of Pennsylvania is a copper-mine, which affords a spring, that appears to have the same qualities as that Irish water, lately described by Dr. William Henry and Dr. Bond in the 47th and 48th volumes of the *Philosophical Transactions*, but is much sharper, for it will dissolve iron in a quarter part of the time; and we are assured, by the accounts transmitted from the proprietors of it of the trials they have made, that it yields the same copper-mud or dust as our Cronebaun-water, of the county of Wicklow, in this kingdom (being the water above mentioned) which being collected from bars of iron immerfed in it, for the purpose of extracting the copper from the Pennsylvania water, it produced above half pure copper on being melted in a crucible; an experiment, that requires to be repeated, in order to ascertain the proportion of copper contained with accuracy; our copper-spring of the county of Wicklow yielding a proportion considerably larger than this, viz. 16 parts of copper out of 20 of the mud.

In the neighbourhood is a great abundance of the ores of vitriol and sulphur, and the spring comes thro'

thro' an immense body of vitriol-ore, and the supply of water is very large, 700 or 800 Hogsheads flowing in 24 hours.

The water is of a pale-green colour, of an acid, sweet, austere, inky and nauseous taste.

It is very ponderous, and instantly betrays the great strength of the metallic impregnation by the hydrometer; which, immersed in this water, presently mounted above the ball, and stood in it nearly at the same height as in a solution of one ounce and six drams of English vitriol in a quart of water.

A little of the solution of pot-ashes instantly precipitates the metallic parts of this water in grains of three different colours, viz. ochre-coloured at the top, green in the middle, and white at the bottom: and the appearances with spirit of hartshorn were much alike, except that the grumes at the bottom participated of a mixture of a blue colour with the white, indicating more clearly the mixture of Copper.

But iron immersed, above all other things, renders the contained copper conspicuous to the eye; for a clean knife, kept in it a few minutes, is covered with a bright copper-colour; and needles and nails kept immersed in it a month in a phial were covered with a rust, partly yellow and shining, which seems to be the copper, and partly a ferrugineous matter, as appeared by the magnet: and that it was partly cupreous appeared by the bright blue tincture extracted by spirit of hartshorn from such parts of the rust, as did not readily fly to the magnet; and, if one might rely on the Philadelphia experiment above-mentioned, the proportion of copper should be very large.

It

It is however certain, that, as in other copper-springs, so in this, here is a very considerable proportion of the vitriol of iron combined with it, and by all experiments a much greater than of the vitriol of copper; and accordingly, galls added to this water turned it first blue (the characteristic of martial vitriol) and then of a dilute ink-colour; and the corks in the bottles were blackened.

But the genuine quality, as well as large proportion, of the impregnating salt, will further appear by the following analysis of this water, viz. A pint of it, exhaled by a slow fire, left 400 grains of solid contents, which were partly green and partly ochre-coloured, with an intermixture of bluish, and of a rough, sweetish taste, like that of sal martis, and appeared to be chiefly saline, not leaving above four grains of indissoluble matter on dissolving 196 grains of it, and filtering.

Thus it appears, that the proportion of vitriolic parts in this water is very large, viz. above six drams to a pint or 3200 grains to a gallon; and consequently it is a stronger solution of vitriol than seawater is of marine salt; and, moreover, is truly considerably the strongest of all the vitriolic waters, that have yet occurred to my observation; for our Cronebaun water, in the county of Wicklow, gives but 256 grains from a gallon; Haigh in Lancashire, (the strongest in Britain, that I know of) 1920 grains; Shadwell 1320; Kilbrew, in the county of Meath, 1530 from the the same quantity; so that besides the copper to be obtained by immersing bars of iron, as in our county of Wicklow water, this water offers to its proprietors another peculiar advantage, viz. an oppor-

opportunity of erecting a copperas-work or manufacture of vitriol, like the Hungarian vitriol; especially the vast supply of water and plenty of fuel in the place considered.

The great strength of the vitriolic impregnation further appears from hence, that a little of this water, laid by in a closet in a porringer, did, by the mere effluvia, without any fire, form large crusts of green vitriol on the brims and outside of the vessel; which vitriol, although it appears both by the colour, taste, and the tincture arising from the mixture of a solution of it with galls, to be of the ferrugineous kind, yet plainly shews, that it partakes of a considerable proportion of copper by imparting the copper-colour, when moistened and rubbed on the blade of a knife, and moreover the indissoluble parts of the sediment of this water left in the filtre on dissolving it, exhibited a bright blue colour on being rubbed, and laid by with spirit of hartshorn; an appearance peculiar to copper.

This water, though justly suspected to be poisonous, if taken in its native strength, yet being lowered with common water it is frequently used for purging and vomiting the country people, and is useful in curing ulcers, and cutaneous disorders, and particularly for sore eyes.

Dublin, 22d, 4th month, April,
1756.